

WHAT IS CLAIMED IS:

1. A magnetic switching device, comprising:
  - a magnetic layer;
  - 5 a transition layer magnetically coupled to the magnetic layer; and
  - a carrier supplier containing at least one material selected from metal and a semiconductor,
  - wherein the transition layer and the carrier supplier are placed in such a manner that a voltage can be applied between the transition layer and
  - 10 the carrier supplier,
  - the transition layer undergoes a non-ferromagnetism – ferromagnetism transition by application of the voltage, and
  - a magnetized state of the magnetic layer is changed by the transition of the transition layer.
- 15 2. The magnetic switching device according to claim 1, wherein the transition layer undergoes the transition when carriers selected from electrons and holes are injected to the transition layer from the carrier supplier under the application of the voltage.
- 20 3. The magnetic switching device according to claim 1, wherein the transition layer undergoes the transition when carriers selected from electrons and holes are induced to the transition layer under the application of the voltage.
- 25 4. The magnetic switching device according to claim 1, wherein the transition is a paramagnetism – ferromagnetism transition or a non-magnetism – ferromagnetism transition.
- 30 5. The magnetic switching device according to claim 4, wherein the transition layer transitions from a paramagnetic state to a ferromagnetic state under the application of the voltage.
- 35 6. The magnetic switching device according to claim 1, wherein the transition layer is in a paramagnetic state or a non-magnetic state when the voltage is not applied thereto, and the transition layer is in a ferromagnetic state when the voltage is applied thereto.

7. The magnetic switching device according to claim 1, wherein the transition layer contains a magnetic semiconductor.
- 5    8. The magnetic switching device according to claim 1, wherein a change in the magnetized state in the magnetic layer is a change in a magnetization direction of the magnetic layer.
- 10    9. The magnetic switching device according to claim 1, wherein the transition layer, the magnetic layer, and the carrier supplier are placed so that the transition layer is interposed between the magnetic layer and the carrier supplier.
- 15    10. The magnetic switching device according to claim 1, further comprising a first insulating layer, wherein the first insulating layer is placed between the transition layer and the carrier supplier.
- 20    11. The magnetic switching device according to claim 10, wherein the transition layer and the carrier supplier are made of p-type or n-type semiconductors having different types, and  
        a P-I-N junction is formed among the transition layer, the first insulating layer, and the carrier supplier.
- 25    12. The magnetic switching device according to claim 1, further comprising an electrode for applying the voltage.
- 30    13. The magnetic switching device according to claim 12, wherein the carrier supplier, the transition layer, and the electrode are placed so that the carrier supplier is interposed between the electrode and the transition layer.
- 35    14. The magnetic switching device according to claim 13, further comprising a second insulating layer placed between the carrier supplier and the electrode.
15. The magnetic switching device according to claim 1, further comprising a magnetic field generating portion for applying a magnetic field to at least one layer selected from the transition layer and the magnetic layer.

16. The magnetic switching device according to claim 15, wherein the magnetic field generating portion is placed so that at least one layer selected from the transition layer and the magnetic layer is interposed between the magnetic field generating portion and the carrier supplier.

17. The magnetic switching device according to claim 15, wherein the magnetic field generating portion includes at least one selected from a ferromagnetic substance, a coil, and a lead.

18. The magnetic switching device according to claim 1, further comprising a detecting portion for detecting a change in a magnetized state of the magnetic layer.

19. The magnetic switching device according to claim 18, wherein the detecting portion includes a magnetoresistive device including a non-magnetic layer, and a free magnetic layer and a fixed magnetic layer placed so as to interpose the non-magnetic layer therebetween,

the magnetic layer and the free magnetic layer are magnetically coupled to each other, and  
a resistance of the magnetoresistive device is varied when a magnetized state of the free magnetic layer is changed along with a change in a magnetized state of the magnetic layer.

20. The magnetic switching device according to claim 18, wherein the detecting portion includes a fixed magnetic layer and a non-magnetic layer, the fixed magnetic layer and the non-magnetic layer are placed so that the non-magnetic layer is interposed between the magnetic layer and the fixed magnetic layer,

the magnetic layer, the non-magnetic layer, and the fixed magnetic layer constitute a magnetoresistive device, and

a resistance of the magnetoresistive device is varied by a change in a magnetized state of the magnetic layer.

21. A magnetic memory, comprising: a plurality of the magnetic switching devices of claim 18; an information recording lead for recording information in the magnetic switching device; and an information reading lead for reading

the information.